

## Case Report

# Serial casting for severe spastic cerebral palsy followed by single-event multilevel surgery

Panji Sananta\*, Tofan M. D. Saputra, Respati S. Dradjat

Department of Orthopaedic and Traumatology, Saiful Anwar General Hospital, Malang, East Java, Indonesia

**Received:** 19 August 2020

**Accepted:** 25 September 2020

### \*Correspondence:

Dr. Panji Sananta,  
E-mail: [panjisanata@ub.ac.in](mailto:panjisanata@ub.ac.in)

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## ABSTRACT

Casting has been used as an adjunct therapy in Cerebral palsy (CP) management. Serial casting is used to inhibit overactivity of plantarflexors, aiding surgical preparation. Currently, the surgical management of CP is done by Single-event multilevel surgery (SEMLS). We aim to report a successful case of adolescent CP treated with SEMLS with prior serial casting. An 18-year-old woman complained of difficulty walking on her feet. The patient used the back of her foot to walk since she was 4-year-old. The patient was premature with birth weight of 1300 grams. She had history of seizure when she was 8-months old. She was diagnosed with clubfoot due to CP. She underwent 3 serial castings in the course of 9 weeks. Serial casting followed by SEMLS could be an effective measure to treat adolescent CP.

**Keywords:** Adolescent, Cerebral palsy, Serial casting, Single-event multilevel surgery

## INTRODUCTION

Cerebral palsy (CP) was described in 1861 by the English Physician William Little, who recognized a link between difficult births and the development of deformities. For many years, CP was known as “Little’s disease.” CP is the most common cause of physical disability affecting children in developed countries. The prevalence is about 2 per 1000 live births and is not decreasing. Children with CP have complex needs and are usually managed by a multidisciplinary team.<sup>1</sup>

Various modalities are available for the management of spasticity. Cast application is one among others. It was used as an adjunct to physical therapy in CP children. Short leg casts were found to be useful in increasing range of motion, tone reduction, decreasing static and dynamic stretch, reducing resistance to passive stretch and dynamic reflex excitability, improving stride length and functional abilities along with providing stability while allowing mobility, initiating weight bearing activities and improving motor skills.<sup>2</sup> Serial casting is used variably to inhibit the overactivity of the ankle plantar flexors or to

lengthen components of the musculotendinous unit. Typically, inhibition is thought to be achieved by maintaining the foot and ankle in a neutral position for a period of over 2 weeks.<sup>3</sup> Statistically significant changes in muscle tone and functional improvement were not found by others. Tone reducing cast was found to be better option than standard one in gait improvement but, maintenance of improvement after cast removal was found difficult in CP children. Still casting was rated as a safe simple procedure equivalent to other non-surgical techniques. Physiotherapy along with casting was found to be superior to physiotherapy alone.<sup>2</sup>

Currently, the concept of surgical treatment of children with CP implies Single-event multilevel orthopedic surgeries (SEMLS) to simultaneously correct orthopedic complications via tendon–muscle procedures and/or procedures involving the bone structures of the limbs.<sup>4</sup> Surgery for children with spastic diplegia used to start at the ankles with TALs for equinus gait. This achieved foot-flat but at the expense of rapidly increasing hip and knee flexion. The second stage of surgery was then to lengthen the hamstrings in order to improve knee extension. This resulted in increased hip flexion and anterior pelvic tilt, so

eventually the hip flexors were lengthened. Finally, transfer of the rectus femoris was considered for knee stiffness.<sup>4</sup>

## CASE REPORT

An 18-year-old woman complains of difficulty walking on her feet. The patient uses the back of her foot to walk. This disorder has been felt when the patient was 4 years old. On her birth history, the patient is the fourth of four children, the patient is twin sister with a third child. The patient was born at a premature age of about 8 months of pregnancy and weight of 1300 gram. When the patient was 8 months old, the patient had a history of seizures. After that disease, the patient became difficult to develop in terms of motor, while her twin sibling who was born simultaneously has no abnormalities. Until the age of 1 year the patient cannot walk like a child at her age. At the age of 4 years, the patient became walking on the back of her feet.

When 18 years old, the patient went to Dr. Saiful Anwar Hospital, Malang for treatment. During her treatment at the Orthopedic division, then the patient was diagnosed with club foot on the CP patient (figure 1). The first treatment was performed by applying Ponsetti cast, then the patient went home and back to control 3 weeks later. Ponsetti cast was removed and did evaluated on her feet. After that the second Ponsetti cast was applied for 3 weeks. In the 6th week after the first treatment, the patient returned to control to the hospital and got evaluation of the second Ponsetti cast. After re-evaluation, a third Ponsetti cast was applied for a duration of 3 weeks and then evaluated it. After 9 weeks of serial Ponsetti cast applied on this patient, the results were quite on target enough and the patient was able to enter into the main therapy called SEMLS.



**Figure 1: Anterior (a) and lateral position (b) of the patient's legs.**

The authors report a case of an 18-year-old woman with CP and equinus foot, three times serial casts were placed for three weeks each, and after that a SEMLS procedure was performed on this patient.

After getting surgery, now the patient gets rehabilitation treatment without any complications.



**Figure 2: Anterior (a) and lateral position (b) of the patient's legs after the Ponsetti cast procedure.**

## DISCUSSION

According to the causes of CP, it can be divided into prenatal, perinatal, and postnatal. Prenatal is associated with infection which is the main cause of damage to fetal brain development, the most common cause is the TORCHES group (Toxoplasmosis, Rubella, Cytomegalovirus, Herpes, and Syphilis). The cause in the perinatal phase is often associated with hypoxia caused by abruptio placenta, premature birth, and sepsis in the neonatal phase which results in the baby becoming born with a low body weight. Postnatal phase is an infection that occurs during childhood can also trigger CP.<sup>5</sup>

In this patient comes to the hospital with complaints could not walk well since 4 years old. This can be associated to the patient's birth history. The patient was born in a premature condition, very low birth weight, and was born in a twin condition. This is consistent with what was explained in Tachdjian where the incidence of CP will increase in children born with very low birth weight, also mentioned the incidence of cerebral palsy diagnosed in 12.3% of infants with gestational age 24 to 33 weeks. On average 50% of children with CP have a history of low birth weight, 28% with a body weight below 1500 g at birth.<sup>5</sup>

This patient shows symptoms of not being able to walk properly since the age of 4 years. The most frequent approach to the classification of CP is a disorder of CP divided into spastic (pyramidal) and dystonia (extrapyramidal). In general children with CP show interrelations of pyramidal and extrapyramidal disorders. Spasticity in CP is by far the most frequent and often occurs in 60% to 85% of cases. In short spasticity occurs due to lesions that attack the pyramidal system and results in increased muscle tone with increased spastic tonic reflexes. CP abnormalities in the musculoskeletal system in children are progressive. At stage 1, children can suffer from spasticity but there are no permanent contractures and non-operative treatment can be performed. At stage 2, there are permanent contractures, and at stage 3 there are contractures and bone deformities that require corrective action from orthopedic surgery.<sup>1</sup>

CP treatment can be done with non-surgery or surgery. Casting is one of the non-surgical surgical modalities for CP. As was the case for this patient, serial casting therapy was performed 3 times with a period of 3 weeks each time serial casting is a conservative technique that may be used to improve joint range in children with idiopathic toe-walking or spasticity. Serial casting in the cerebral palsy patient population has been shown to improve range of motion. Serial casting uses a series of casts to stretch soft tissue (i.e. muscles) for an extended period of time. This is done by applying a series of casts to gradually improve the child's range of motion. The goal of serial casting at the knee or ankle is to provide increased passive range of motion, prevent complications of deformity-producing positions, allow future use of orthotics when needed, and promote highest level of function and mobility. Following casting, the therapeutic program includes: home stretching, bivalved casts used as night splints for prolonged stretching, and ongoing physical therapy treatment for strengthening and functional mobility training. Casting provides stability and prolonged stretch of a muscle which is immobilized in a lengthened position. When completed in a series using incrementally increasing angle of stretch, it has been found effective in improving range of motion by changing passive mechanical properties, reorganizing the structure of the connective tissue, and increasing number of sarcomeres of the muscle.<sup>6</sup>

SEMLS is one of the therapeutic modalities of surgery in the treatment of CP. Patients according to the above case, after serial casting for approximately 9 weeks, performed surgical treatment in the form of SEMLS. The gold standard approach to the operative treatment of orthopedic complications in patients with CP is to perform SEMLS. This is most often defined as two or more surgical procedures of the soft tissue or bone at two or more anatomical levels during one operative procedure. In some circumstances, for example for surgeries to reconstruct large joints, procedures qualifying as SEMLS may occur 3-6 weeks apart, but involve only one hospital admission, and the period of rehabilitation remains the same for both surgeries. The major advantage of the SEMLS approach is that faulty limb positions and lower limb deformities can

be corrected simultaneously, which decreases the number of operations the patient must endure and requires a single period of rehabilitation.<sup>4</sup>

## CONCLUSION

Serial cast placement of patients with cerebral palsy who suffer from spastic can accelerate the therapeutic goal of SEMLS.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: Not required*

## REFERENCES

1. Weinstein SL, Flynn JM, Lovell and Winter's Pediatric Orthopaedics. 7th edition. Philadelphia: Wolters Kluwer. 2014;511-481.
2. Jain S, Mathur N, Joshi M, Jindal R, Goenka S. Effect of serial casting in spastic cerebral palsy. Indian J Pediatr. 2008;75(10):997-1002.
3. McNee AE, Will E, Lin J-P. The effect of serial casting on gait in children with cerebral palsy: preliminary results from a crossover trial. Gait Posture. 2007;25(3):463-8.
4. Tomov A, Bidiamshin R, Evreinov V, Leonchuk SS. Results of single-event multilevel orthopedic surgery in children with cerebral palsy Results of single-event multilevel orthopedic surgery in children with cerebral palsy. 2015;2(25):1-7.
5. Tachdjian MO. Pediatric Orthopaedics. 5th edition. Philadelphia: Elsevier. 2014;e3.
6. woosley m, anderton r. serial casting of the lower extremity. evidence-based care guideline for management of serial casting in children. 2009;11-1.

**Cite this article as:** Sananta P, Saputra TMD, Dradjat RS. Serial casting for severe spastic cerebral palsy followed by single-event multilevel surgery. Int J Res Med Sci 2020;8:4115-7.